REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	AC testing at V_{CC} = 2.0 V and V_{CC} = 6.0 V and subgroups 10 and 11 shall be guaranteed if not tested. Change t_{PLH1} and t_{PHL1}. Add vendors FSCM 04713, FSCM 27014, and FSCM 18714.	1985 Dec 30	M. A. Frye
B	Add vendor Cage 18324 to cases E, F, and 2. Change code ident. no. from 14933 to 67268. Change to military drawing format. Inactivate case outlines 01EX and 012X for new design. Use M38510 QPL device. Editorial changes throughout.	1989 Jan 18	M. A. Frye

CURRENT CAGE CODE 67268

REV																				
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REV STATUS OF SHEET															
REV	B	B	B	B	B	B	B	B	B	B	B				
SHEET	1	2	3	4	5	6	7	8	9	10	11				

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY
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Michael A. Frye

DRAWING APPROVAL DATE
22 October 1984

REV B

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, DIGITAL, HIGH-SPEED CMOS DUAL 2-TO-4 DECODER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**14933**	84092

SHEET 1 OF 11

DESC FORM 193-1
MAY 86

5962-E976

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

84092	01	E	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	54HC139	Dual 2-TO-4 DECODER

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
E	D-2 (16-lead, .840" x .310" x .200"), dual-in-line-package
F	F-5 (16-lead, .440" x .285" x .085"), flat package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings. 1/

Supply voltage range - - - - - - - - - - - - - - - -0.5 V dc to +7.0 V dc
DC input voltage- - - - - - - - - - - - - - - - - - -0.5 V dc to V_{CC} +0.5 V dc
DC output voltage - - - - - - - - - - - - - - - - - -0.5 V dc to V_{CC} +0.5 V dc
Clamp diode current - - - - - - - - - - - - - - - - ±20 mA
DC output current (per pin)- - - - - - - - - - - - - ±25 mA
DC V_{CC} or GND current (per pin) - - - - - - - - - ±50 mA
Storage temperature range - - - - - - - - - - - - - -65°C to +150°C
Maximum power dissipation, (P_D) - - - - - - - - - 500 mW 2/
Lead temperature (soldering, 10 seconds) - - - - +260°C
Thermal resistance, junction-to-case (Θ_{JC}):
  Cases E and F - - - - - - - - - - - - - - - - - - (See MIL-M-38510, appendix C)
  Case 2 - +60°C/W
Junction temperature (T_J) - - - - - - - - - - - - - +175°C

1.4 Recommended operating conditions.

Supply voltage range (V_{CC}) - - - - - - - - - - - - +2.0 V dc to +6.0 V dc
Case operating temperature range (T_C) - - - - - - - -55°C to +125°C
Input rise or fall time: 3/
  V_{CC} = 2.0 V- 0 to 1000 ns
  V_{CC} = 4.5 V- 0 to 500 ns
  V_{CC} = 6.0 V- 0 to 400 ns

1/ Unless otherwise specified, all voltages are referenced to ground.
2/ For T_C = +100°C to +125°C, derate linearly at 12 mW/°C.
3/ See figure 3.

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Logic diagram. The logic diagram shall be as specified on figure 2.

3.2.4 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-833 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.3 herein.

3.5 Certification of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.3. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1herein) shall be provided with each lot of microcircuits delivered to this drawing.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ unless otherwise specified 1/		Group A subgroups	Limits		Unit
					Min	Max	
High-level output voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}, $\lvert I_O \rvert \le 20$ µA	$V_{CC} = 2.0$ V	1, 2, 3	1.9		V
			$V_{CC} = 4.5$ V		4.4		
			$V_{CC} = 6.0$ V		5.9		
		$\lvert I_O \rvert \le 4.0$ mA	$V_{CC} = 4.5$ V		3.7		
		$\lvert I_O \rvert \le 5.2$ mA	$V_{CC} = 6.0$ V		5.2		
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}, $\lvert I_O \rvert \le 20$ µA	$V_{CC} = 2.0$ V	1, 2, 3		0.1	V
			$V_{CC} = 4.5$ V			0.1	
			$V_{CC} = 6.0$ V			0.1	
		$\lvert I_O \rvert \le 4.0$ mA	$V_{CC} = 4.5$ V			0.4	
		$\lvert I_O \rvert \le 5.2$ mA	$V_{CC} = 6.0$ V			0.4	
High-level input voltage	V_{IH}	2/	$V_{CC} = 2.0$ V	1, 2, 3	1.5		V
			$V_{CC} = 4.5$ V		3.15		
			$V_{CC} = 6.0$ V		4.2		
Low-level input voltage	V_{IL}	2/	$V_{CC} = 2.0$ V	1, 2, 3		0.3	V
			$V_{CC} = 4.5$ V			0.9	
			$V_{CC} = 6.0$ V			1.2	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ unless otherwise specified 1/		Group A subgroups	Limits		Unit
					Min	Max	
Input capacitance	C_{IN}	V_{IN} = 0 V, T_C = +25°C		4		10	pF
Quiescent current	I_{CC}	V_{CC} = 6.0 V, V_{IN} = V_{CC} or GND		1, 2, 3		160	µA
Input leakage current	I_{IN}	V_{CC} = 6.0 V, V_{IN} = V_{CC} or GND		1, 2, 3		±1	µA
Functional tests		See 4.3.1d.		7			
Propagation delay time, data to output 3/	t_{PHL1}, t_{PLH1}	T_C = +25°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	9		220	ns
			V_{CC} = 4.5 V			44	
			V_{CC} = 6.0 V			38	
		T_C = -55°C, +125°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	10, 11		320	ns
			V_{CC} = 4.5 V			64	
			V_{CC} = 6.0 V			54	
Propagation delay time, select to output 3/	t_{PHL2}, t_{PLH2}	T_C = +25°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	9		220	ns
			V_{CC} = 4.5 V			44	
			V_{CC} = 6.0 V			38	
		T_C = -55°C, +125°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	10, 11		320	ns
			V_{CC} = 4.5 V			64	
			V_{CC} = 6.0 V			54	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ unless otherwise specified 1/		Group A subgroups	Limits		Unit
					Min	Max	
Propagation delay time, output enable to output 3/	t_{PHL3}, t_{PLH3}	T_C = +25°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	9		175	ns
			V_{CC} = 4.5 V			35	
			V_{CC} = 6.0 V			30	
		T_C = -55°C, +125°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	10, 11		225	ns
			V_{CC} = 4.5 V			51	
			V_{CC} = 6.0 V			44	
Transition time 4/	t_{THL}, t_{TLH}	T_C = +25°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	9		75	ns
			V_{CC} = 4.5 V			15	
			V_{CC} = 6.0 V			13	
		T_C = -55°C, +125°C, C_L = 50 pF ±10%, See figure 3	V_{CC} = 2.0 V	10, 11		110	ns
			V_{CC} = 4.5 V			22	
			V_{CC} = 6.0 V			19	

1/ For a power supply of 5 V ±10% the worst case ouput voltages (V_{OH} and V_{OL}) occur for HC at 4.5 V. Thus, the 4.5 V values should be used when designing with this supply. Worst case V_{IH} and V_{IL}, occur at V_{CC} = 5.5 V and 4.5 V respectively. (The V_{IH} value at 5.5 V is 3.85 V.) The worst case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0 V values should be used. Power dissipation capacitance (C_{PD}), typically 75 pF, determines the no load dynamic power consumption, $P_D = C_{PD} (V_{CC} \times V_{CC}) f + (I_{CC} \times V_{CC})$ and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

2/ Test not required if applied as a forcing function for V_{OH} or V_{OL}.

3/ AC testing at V_{CC} = 2.0 V and V_{CC} = 6.0 V shall be guaranteed, if not tested, to the specified limits.

4/ Transition times, (t_{TLH}, t_{THL}), if not tested, shall be guaranteed to the specified limits.

DEVICE TYPE 01

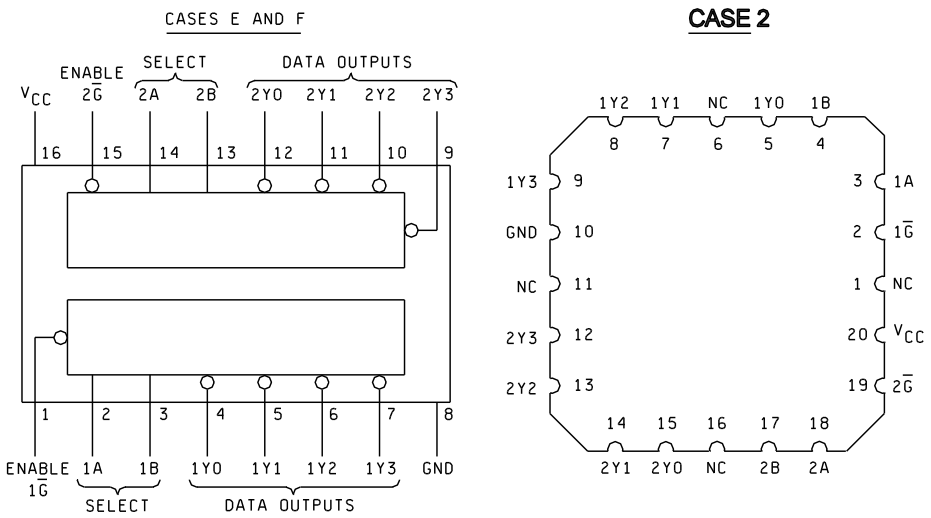

FIGURE 1. Terminal connections.

Inputs			Outputs			
Enable	Select					
$\overline{G}$	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

H = high level, L = low level, X = Don't care

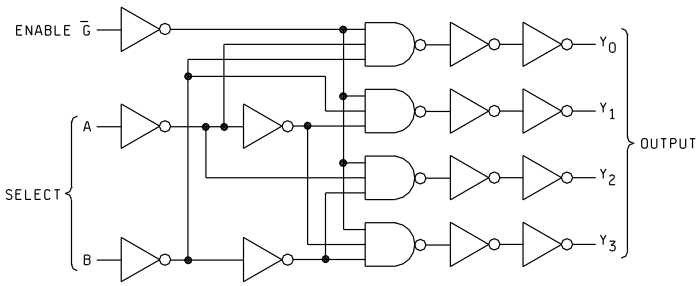

FIGURE 2. Truth table and Logic diagram.

STANDARDIZED	SIZE **A**		84092
MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444		REVISION LEVEL B	SHEET 7

DEVICE TYPE 01

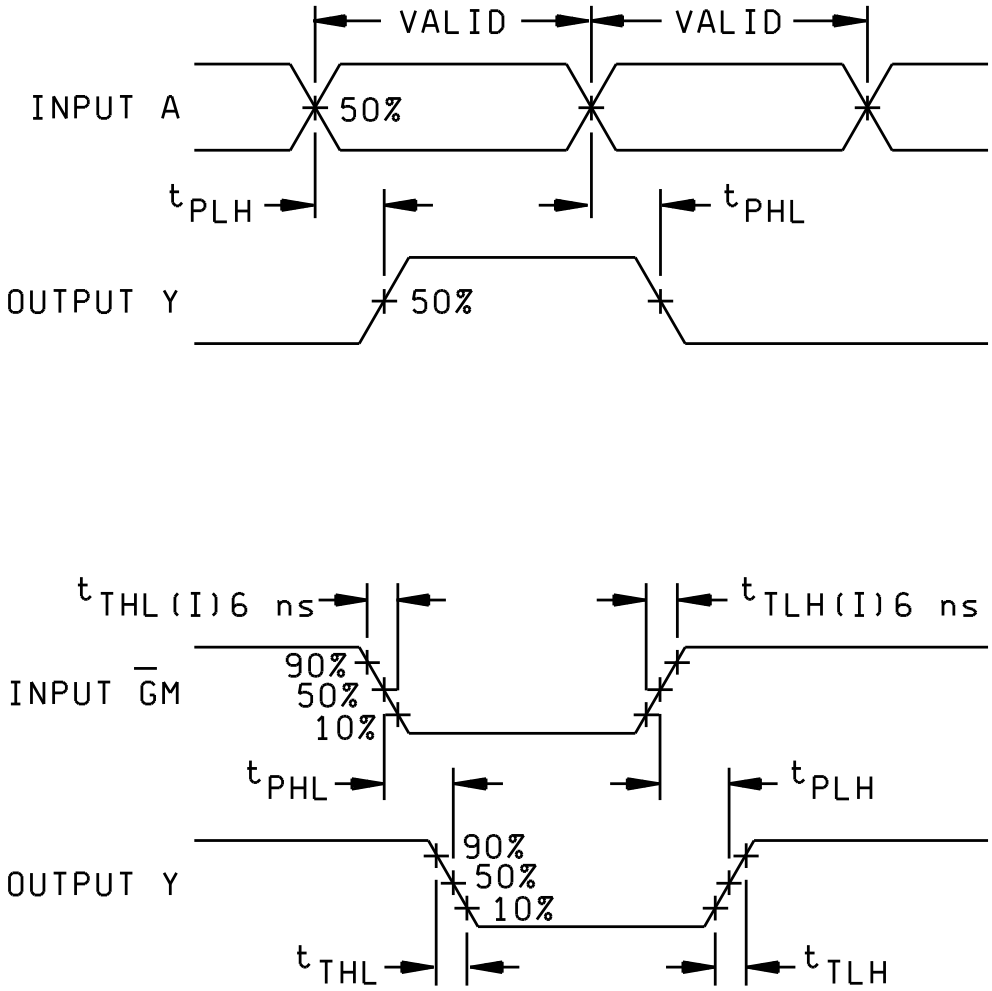

FIGURE 3. Switching waveform.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE **A**		84092
		REVISION LEVEL B	SHEET 8

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test (method 1015 of MIL-STD-883).

(1) Test condition A, B, C, D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) T_A = +125°C, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 5, 6, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance. Test all applicable pins on 5 devices with zero failures.

d. Subgroup 7 test shall verify the truth table specified on figure 2.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	- - -
Final electrical test parameters (method 5004)	1*, 2, 3, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 9, 10**, 11**
Group C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.
** Subgroups 10 and 11, if not tested, shall be guaranteed to the specified limits in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replacebility is determined as follows:

a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/65803B- -.

6.3 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/	Replacement military specification part number
8409201EX 2/	01295 04713 27014 18714 18324	SNJ54HC139J 54HC139/BEAJC MM54HC139J/883 CD54HC139F/3A 54HC139/BEA	M38510/65803BEX
8409201FX	01295 18324	SNJ54HC139W 54HC139/BFA	M38510/65803BFX
84092012X 2/	01295 04713 18324 27014	SNJ54HC139FK 54HC139M/B2AJC 54HC139/B2A MM54HC139E/883	M38510/65803B2X

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance reqirements of this drawing.

2/ Inactive for new design, use MIL-M-38510 QPL device.

Vendor CAGE number	Vendor name and address
01295	Texas Instruments, Inc. P.O. Box 6448 Midland, TX 79701
04713	Motorola, Inc. 7402 S. Price Road Tempe, AZ 85283
18324	Signetics Corporation 4130 South Market Court Sacramento, CA 95834
18714	GE/RCA Corporation Route 202 Somerville, NJ 08876
27014	National Semiconductor P.O. Box 58090 Santa Clara, CA 95052-8090